

NOTICE

All drawings located at the end of the document.



Rocky Flats Environmental Technology Site

Reconnaissance Level Characterization Package for the Building 111 Cluster

September 2000

Revision 0

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1.0 INTRODUCTION

This Characterization Package is designed to describe the necessary surveys and sampling for Reconnaissance Level Characterization (RLC) and Pre-Demolition Survey (PDS) in preparation for release of the RFETS Building 111 (B111) Cluster Facilities B111 and the Guard Post (B111B). The RLC will confirm the typing of the facilities presented in the *Decommissioning Program Plan* (Type 1). The PDS requirements will be met to enable unrestricted release of building materials. The characterization approach is based upon the *Reconnaissance Level Characterization Plan* (RLCP), contained in the *Decontamination and Decommissioning Characterization Protocol* (DDCP, MAN-077-DDCP), and the *Pre-Demolition Survey Plan* (PDSP, MAN-127-PDSP), including the Data Quality Objectives (DQOs) presented in both documents. The DQOs used to implement this approach are presented below. The DQO process was used to evaluate existing information and data and to determine additional characterization requirements needed to define building hazards (i.e., radiological, chemical and physical) per Attachment 9 of the Rocky Flats Cleanup Agreement (RFCA) and to initially identify anticipated waste streams. All quality assurance requirements presented in the DDCP will be followed.

Existing data on radiological and non-radiological hazards associated with the facilities are insufficient to address the applicable DQO decision rules. In general, existing radiological survey data are dated, are limited in terms of areas covered and type of contamination measured, and are not retrievable. Likewise, there are limited data on non-radiological hazards, including historical releases associated with photographic processes, asbestos-containing materials, and PCBs contained within fluorescent light fixtures, the Transformer 111-1 dielectric fluid, and the hydraulic oil used in the elevator lift system.

Radiological Characterization

Based upon historical and process knowledge, the radiological contaminants of concern for the purposes of surveys and sampling were determined to be uranium, plutonium, and americium. Radiological surveys for fixed and removable contamination will be conducted on interior and exterior walls, floors, ceilings and roofs, as directed by the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). All survey units in the B111 Cluster will be initially characterized as Impacted Class 3 (Type 1) units. As directed in the MARSSIM and the PDSP, Impacted Class 3 survey units require a statistically determined number of randomly-generated survey points. Class 3 survey units are defined as areas that are not expected to contain any residual or elevated (i.e., greater than $DCGL_w$) radioactivity. Additionally, a 10% surface scan biased towards areas of highest potential for contamination will be performed.

All efforts will be made to have as much as possible removed from the facility prior to pre-demolition survey activities. Any structural materials remaining in the building for survey and demolition (i.e., piping, suspended ceiling braces, electrical breaker boxes, etc.) will have the same potential for contamination as any surfaces that are surveyed or scanned. Again, Class 3 implies that contamination is not expected to have residual radioactivity, so these structural items/materials have no greater probability for contamination than other structural surfaces, and may remain in place for pre-demolition survey. Radiological measurements and samples (if necessary) will be collected per the RFETS Radiological Safety Practices 16.00 Series as applicable.

Non-Radiological Characterization

The non-radiological contaminants of concern for the purposes of sampling were determined to be PCBs, asbestos-containing materials, and toxic "heavy" metals associated with silver bearing photographic fixer solution. Asbestos sampling and analyses will be performed per PRO-563-ACPR, *Asbestos Characterization Procedure*. Core and liquid sampling for PCBs and TCLP metals will be performed in accordance with PRO-487-MPCR *Metals and PCB Characterization Procedure* and PRO-488-BLCR *Bulk Solids and Liquids Characterization Procedure*.

The characterization requirements for the B111 Cluster are summarized in Table 1-1.

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**Table 1-1: SUMMARY OF
 CHARACTERIZATION REQUIREMENTS**

For all required surveys and sampling, historical and RLC data will be either provided as attachments to the Reconnaissance Level Characterization Report (RLCR) or maintained in the project file		
Contaminant	Sample/ Survey Amount & Type	Comments
Radiological contaminants (Pu, U, and Am)	A total of 420 surface activity measurements (14 survey units with 30 per survey unit) plus biased scans	Surface activity measurements will include fixed and removable contamination surveys for alpha. Biased scans will be performed on floors and external surfaces in seams, cracks, corners, and other locations where contamination is expected to accumulate. At a minimum, 10% of the total area will be scanned. Note Two (2) QC measurements (TSA only) will be required for each survey unit (28 QC measurements total).
RCRA constituents (i.e., metals, volatile organics)	A total of 8 TCLP metal samples: 4 concrete cores (3 and 1 duplicate) of Room #7 photo processing area & sanitary drain, 1 sedt- parking lot manhole, 1 sedt- mech room/ confined space, 1 sedt - grate by lift, 1 sedt - mech room green tub A total of 3 TCLP volatile samples: 1 sedt- parking lot manhole, 1 sedt- mech room/ confined space, 1 sedt - grate by lift	There have been historical releases of photographic fixer solution, containing silver and other metals, in the B111 basement. Documentation indicates that the spills were cleaned up, however, cleanup verification data could not be specifically identified, and there is a potential for heavy metal concentrations in the concrete that may exceed the RCRA maximum concentrations for toxicity characteristic. According to historical and process knowledge, no other RCRA-regulated chemicals were used or stored in B111 and B111B (<i>D&D Facility Characterization Interview Checklist and Facility Checklist</i>) however, due to the age of the facility, sampling for chemical contaminants is necessary and will be conducted to verify that cleanup was adequate, including potentially impacted drains, and that no other constituents are present.
Asbestos	Inspection for friable and non- friable asbestos Approximately 250 samples from suspect asbestos- containing materials	The interior and exterior of B111 will need to be inspected for both friable and non-friable asbestos. This will include walls, floor and ceiling tiles, roofing materials, adhesives, insulation, and remaining systems/equipment. B111B was constructed in 1990 and is assumed to contain all asbestos-free materials. Limited previous data are available for portions of Building 111, and some of the insulated lines are marked "asbestos-free." The data, however, are incomplete and the newer insulation may overlap some of the older asbestos-containing insulation. Transite board and multiple types of ceiling tiles must also be evaluated. Sampling will be conducted at the discretion of a CDPHE-certified asbestos inspector.

3 0 CHARACTERIZATION INSTRUCTION FOR RADIOLOGICAL SURVEYS

The Building 111 Cluster will have radiological characterizations performed pursuant to the MARSSIM, the PDSP, and applicable RFETS Radiological Safety Practices (RSPs) RSPs governing the pre-demolition radiological characterization consist of the following

- *PRO-475-RSP-16 01, Radiological Survey/Sampling Package Design, Preparation, Control, Implementation and Closure*
- *PRO-476-RSP-16 02, Radiological Surveys of Surfaces and Structures*
- *PRO-477-RSP-16 03, Radiological Samples of Building Media*
- *PRO-478-RSP-16 04, Radiological Survey/Sample Data Analysis*
- *PRO-479-RSP-16 05, Radiological Survey/Sample Quality Control*

3.1 Background

An historical assessment of B111 shows little or no potential for having DOE-controlled radiological contamination (i.e., uranium (non-NORM), plutonium, americium, and their respective progeny) Constructed in the early 1950's, the facility was used as administrative offices, with a photographic development area operating in the north section of the basement An auditorium was added to the west wing of B111 in the late 1960's (the auditorium underwent extensive remodeling in 1988) No laboratories were located in the building, and weapons production activities never occurred in B111 Based on this historical assessment, B111 Cluster was initially classified as a Type 1 Building (MARSSIM - Impacted Class 3), since all areas of the structure are not expected to contain any residual radioactivity from DOE-controlled radioactive materials

The lack of historical radiological survey data and the (remote) potential for an undocumented introduction of DOE-controlled radioactive materials into B111 requires the performance of a pre-demolition radiological characterization

3 2 Survey Breakdown Structure

The Building 111 Cluster consists of B111 and a small guard post (B111B) The main area of the building is two stories with a basement The attached west wing of B111 is a single story structure with a large auditorium addition attached to the far-west side of the building The B111 Cluster will be divided into seven survey areas

- A – the entire basement area (including the east stairwell exit from photography)
- B – the entire first floor of B111
- C – the entire second floor of B111
- D – stairwells located on the east-side of the main building (by exit doors 5 & 7)
- E – the entire roof of B111
- F – exterior walls of B111
- G – the entire guard post structure (B111B), including interior, exterior and roof

These survey areas are broken down further into 14 survey units based primarily on similar characteristics and contamination potentials Survey unit designations are shown in the attached floor-plan maps (Attachments 1a, 1b & 1c) and are described in Table 3-1

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**Table 3-1: B111 CLUSTER SURVEY
 BREAKDOWN STRUCTURE**

Survey Area & Unit (Survey Package ID No)	Description	Approx Floor Area * (m²)	Survey Unit Classification
Survey Area A (Basement)			
Unit 111-A-001	Photography Area (north)	414	Impacted Class 3
Unit 111-A-002	Mechanical Area (south)	718	Impacted Class 3
Survey Area B (First Floor)			
Unit 111-B-003	Auditorium Area	262	Impacted Class 3
Unit 111-B-004	West Wing	632	Impacted Class 3
Unit 111-B-005	Main Bldg – South	558	Impacted Class 3
Unit 111-B-006	Main Bldg – North	642	Impacted Class 3
Survey Area C (Second Floor)			
Unit 111-C-007	South Area	600	Impacted Class 3
Unit 111-C-008	North Area	507	Impacted Class 3
Survey Area D (Stairwells)			
Unit 111-D-009	Stairwell (Door No 7)	< 100	Impacted Class 3
Unit 111-D-010	Stairwell (Door No 5)	< 100	Impacted Class 3
Survey Area E (B111 Roof)			
Unit 111-E-011	Roof	2,146	Impacted Class 3
Survey Area F (Exterior Walls)			
Unit 111-F-012	Main Bldg Exterior Walls	1,229	Impacted Class 3
Unit 111-F-013	West Wing Exterior Walls	579	Impacted Class 3
Survey Area G (B111B Guard Post)			
Unit 111-G-014	Guard Post Structure	< 100	Impacted Class 3

- Floor areas are approximated from floor-plan drawings Actual areas on survey unit maps will be to scale

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3.3 Radiological Survey and Sampling Methodology

The radiological contaminants of concern for the purposes of surveys and sampling are determined to be uranium, plutonium and americium. For the purposes of this pre-demolition radiological characterization, the more restrictive transuranic release limits required in DOE Order 5400.5 and as listed in Table 7-1 of the Site PDSP will be applied.

Radiological Engineering has determined that use of the more restrictive transuranic release limits precludes the need for beta-gamma measurements for this pre-demolition radiological characterization. Beta-gamma measurements are unnecessary based on the fact that for materials contaminated with plutonium, uranium, or mixtures of both, the alpha activity release limit is more restrictive than the uranium and beta-gamma emitter release limits required by DOE Order 5400.5. Therefore, alpha scans and contamination surveys will be used to assess the radiological contamination in the B111 Cluster.

A Survey Package and Data Summary will be produced for each survey unit. Survey packages will contain a cover sheet, survey/sampling instruction form, total surface activity data sheet, removable contamination data sheet, instrument sheet, investigation forms, signature sheets, and other required documentation as prescribed in the PDSP (Rev. 0).

Survey maps will be developed to accurately define the boundaries of each survey unit and to document specific measurement locations. Measurement locations will be clearly identified to provide a method of referencing survey results to survey/sample locations. All survey units are designated Impacted Class 3, so specific survey points in each survey unit will be established on a random basis. These randomly generated survey points will be determined in accordance with PRO-475-RSP-16.01, *Radiological Survey/Sampling Package Design, Preparation, Control, Implementation, and Closure*.

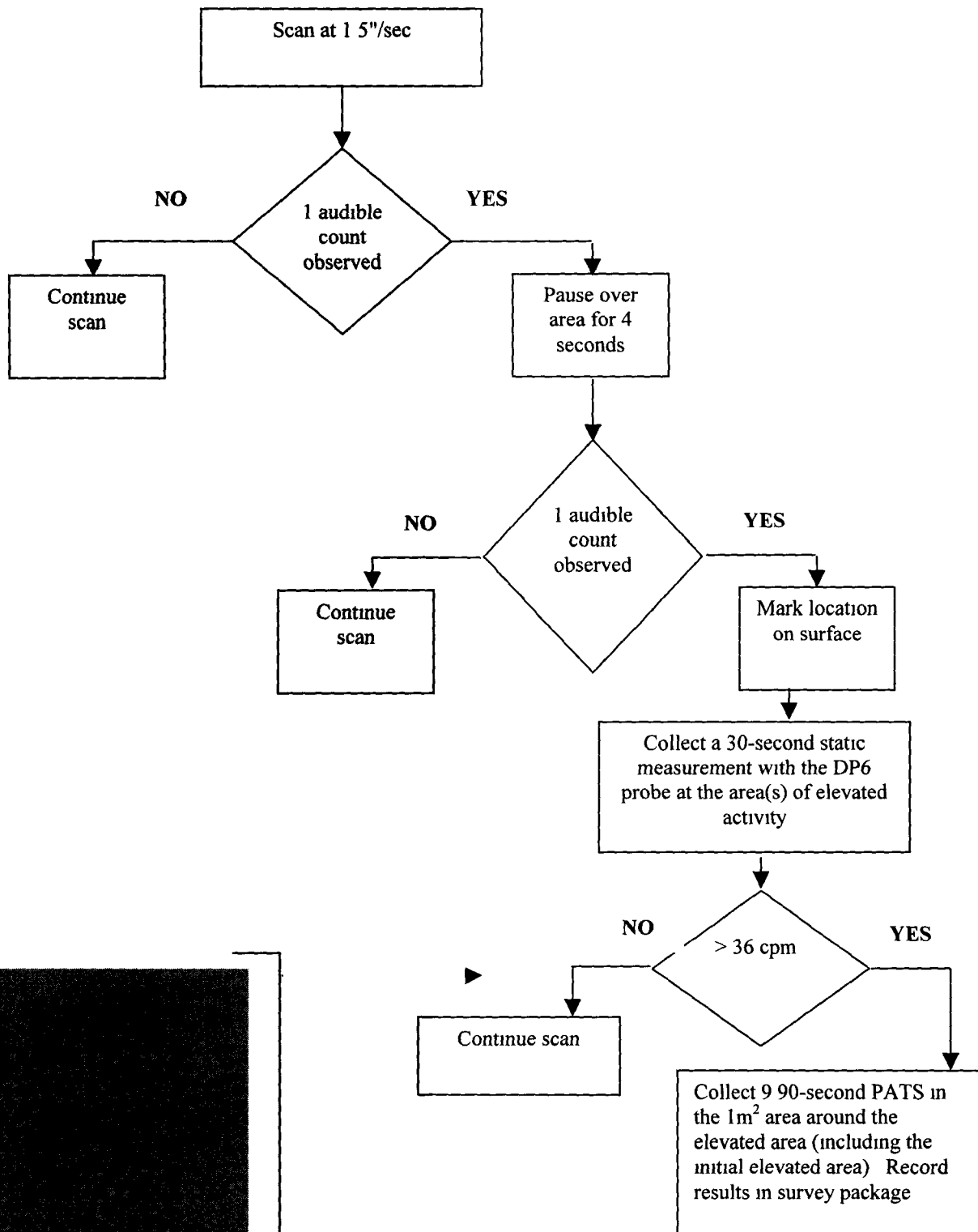
3.3.1 Surface Scans

Surface scan coverage for each survey unit will be a minimum of 10 percent (10%), as listed in Appendix A, Table A-1 of the PDSP. Surface scanning for alpha activity will be biased towards areas of suspected contamination such as carpet surfaces, flooring, corner areas, lower walls, and window ledges. If extensive contamination is being found on lower areas of the survey unit, scans should be performed on the upper surfaces of the survey unit. Due to its tar/gravel surface construction, the roof of the B111 structure does not lend itself towards radiological scanning. For this survey unit, scanning will be biased towards areas that are more easily scanned, such as ventilation ducting, HVAC system component exteriors, and other "non-gravel" areas. Survey unit maps of the roof will denote these areas, and the survey unit package for the roof will instruct the survey technicians to focus attention on these surveyable areas. Figure 3.1 shows the methodology to be used for performing alpha scan surveys.

If an area of elevated activity is identified during the scan of a survey unit, an investigation will be performed to confirm the presence of elevated activity. If elevated activity is confirmed, the location of interest shall be marked, and surface activity measurements for total and removable activity shall be performed at that location. Figure 3.2 shows the investigation methodology to be used for performing an investigation.

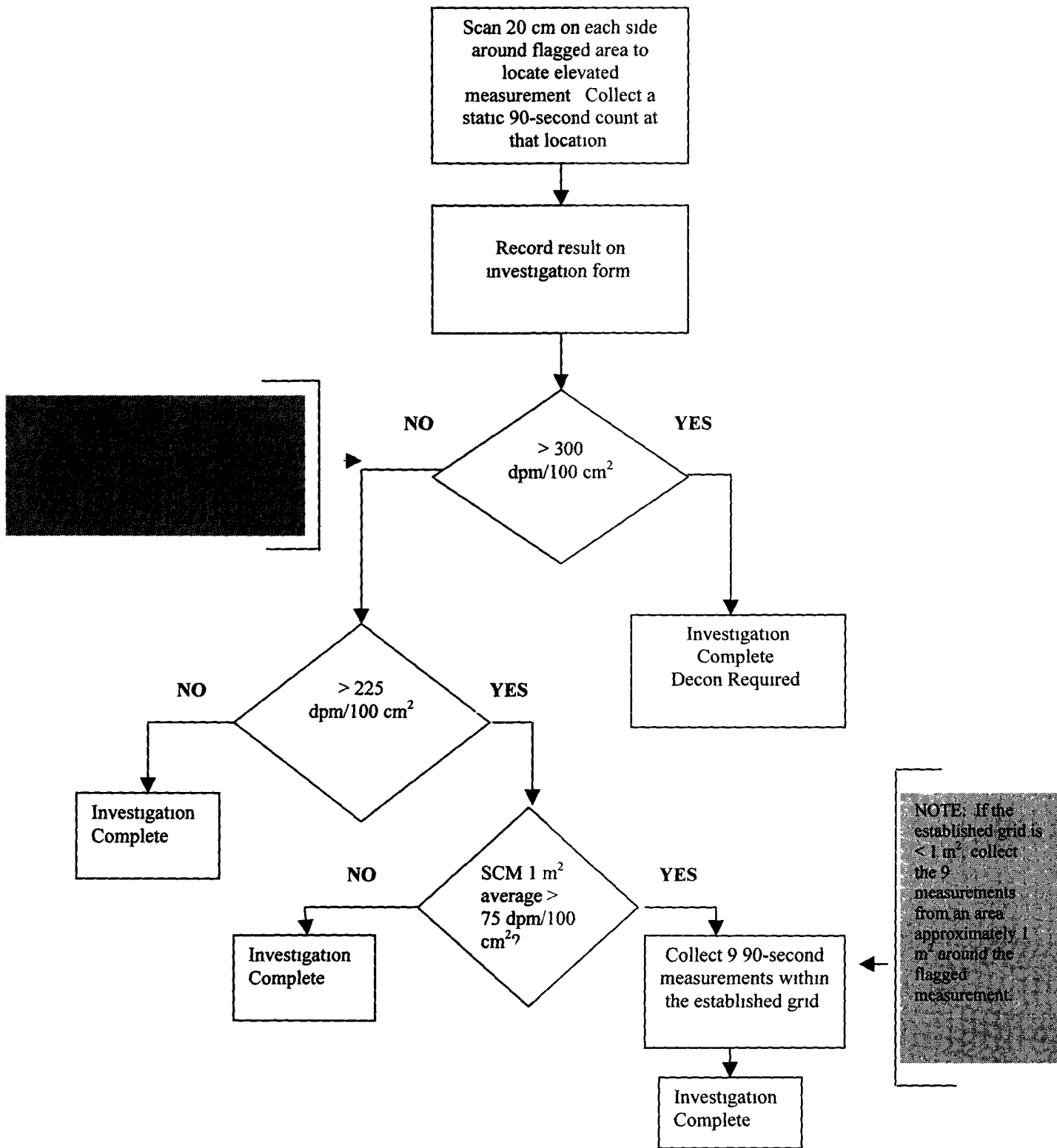
Note that investigation locations will be in addition to the randomly prescribed number of measurements for that survey unit. This additional measurement location will not be included in the survey unit statistical test. Rather, it will be compared directly to the applicable $DCGL_{EMC}$ (for 100 cm^2) and the $DCGL_W$ (for average over m^2).

Figure 3.1 Alpha Scanning Methodology (using a DP6 probe)



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Figure 3 2 Investigation Method for Elevated Alpha Scan Reading (DP6 Probe)



3.3.2 Surface Activity Measurements

Total and removable surface activity measurements shall be collected at random measurement locations. The minimum total surface activity and removable surface activity readings required for each survey unit shall be 15 measurements (i.e., 15 total activity measurements and 15 removable activity measurements). This minimum number of measurements was determined using the Total Surface Activity Measurement Calculation Worksheet presented in Appendix B of the PDSP. Survey points will be randomly generated and may fall on any surface area of the survey unit (e.g., floors, walls, ceilings, etc.).

If any randomly generated survey point falls on a carpeted floor, an adequate area of the carpet shall be radiologically scanned, cut and removed. Radiological measurements (total activity and removable activity) on the flooring below the carpeted surface will be documented on the appropriate forms.

The Radiological Control Technician (RCT) will obtain 100 cm² total alpha direct measurements (and an accompanying local area background measurement) at each labeled measurement location per 3-PRO-165-RSP 16 02, *Contamination Monitoring Requirements*. The RCT will record the results of each measurement on the applicable survey unit's *Total Surface Activity Data Sheet*.

The RCT will obtain 100 cm² removable alpha measurements (smears) at each labeled measurement location per 3-PRO-165-RSP 16 02, *Contamination Monitoring Requirements*. The RCT shall record the results of each measurement on the applicable survey unit's *Removable Contamination Data Sheet*.

3.3.3 Surface Media Sampling

Based on the radiologically "benign" nature of the B111 Cluster, surface media sampling is not anticipated for any of the identified survey units (surface media samples are typically not required for Class 3 survey units).

The only survey unit assessed for media sampling was the roof of B111. Review of B111 historical documents showed a total re-roofing occurred in the early 1970's. The original roofing consisted of butyl rubber covering over 1/2-inch of mineral-fiber insulation. As stated in the reviewed plan (RFETS DWG No. 19519-1, 19520-1 through 19520-5, and 19521-1 through 19521-5), "All roofing material and insulation, flashing, cants, etc. shall be removed from the roof." Therefore, any potentially impacted roofing material from RFETS historical releases (e.g., the 1969 fire) was removed and replaced with new materials. This information, combined with the Impacted Class 3 MARSSIM classification, precludes the need for surface media sampling.

If elevated readings (due to DOE-added radionuclides) are found during the radiological characterization of the roof, surface media samples may be collected and analyzed as described in the PDSP (Rev. 0) and the applicable RSPs. Samples are normally collected at the total/removable surface activity measurement locations of interest (i.e., areas of elevated activity). If at all possible, the size (total mass) of the sample should be minimized to avoid skewing the pCi/g to dpm/100 cm² conversion (required to compare media sample results against DOE 5400.5 release criteria). The ideal sample size is 100 square centimeters or approximately 5 - 10 grams of material, whichever is possible.

3.4 Radiological Survey QC Requirements

Quality assurance (QA) and quality control (QC) requirements as presented in the PDSP and RSP-16 05, *Radiological Survey/Sample Quality Control* will be implemented during the pre-demolition radiological characterization to collect information necessary to evaluate the survey results.

To establish the overall precision, or reproducibility of surveys, duplicate measurements shall be performed. As listed in the PDSP, the minimum number of required QC total surface activity surveys are as follows:

"Greater than or equal to 5% of the direct measurement surveys shall be repeated, and a quantitative assessment shall be performed where acceptance of the comparison is constituted by either (1) both results are < DCGL or (2) there is less than 20% difference between the two duplicate measurements."

Removable activity measurements do not require duplicate QC measurement comparison.

The duplicate total surface activity measurements shall be either random or, if biased, biased towards areas with higher contamination potential (e.g., floors, drainage areas, ledges, etc.).

As stated, the minimum number of total surface activity measurements for an Impacted Class 3 survey unit is 15. Using the aforementioned QC requirements, a minimum of two (2) total surface activity QC measurements per survey unit is anticipated. These QC measurements should be performed with a different survey instrument (if possible) and by a different technician than the person who performed the initial survey. Forms within each survey package shall accommodate and easily distinguish QC measurements, and the Data Summary calculation sheets will compare the measurements as well.

3.5 Summary

Radiological Engineering has determined the B111 Cluster to consist of seven survey areas (A – G), with fourteen (14) individual survey units. The historical assessment of the B111 Cluster suggests little or no potential for radiological contamination. All survey units are classified as "Impacted Class 3". See Table 3-1 of this document for details on individual survey areas and their respective survey units.

Appendix A of the RFETS PDSP (MAN-127-PDSP, Rev 0) lists a 10 % minimum scanning frequency for all Impacted Class 3 survey units. Scans will be biased towards areas traditionally found to contain contamination (e.g., floors, carpeting, lower walls).

As prescribed in Appendix B of the PDSP, the default values to be utilized when minimal characterization is available in an Impacted Class 3 survey unit are as follows:

- Minimum of 15 Total Surface Activity measurements for each survey unit
- Minimum of 15 Removable Surface Activity measurements for each survey unit

Wherever a randomly-generated sample point falls on a carpeted area, an adequate area of carpeting will be removed and radiological surveys will be performed on the flooring surface.

Total surface activity measurements (and an accompanying removable surface activity measurement) will be performed under any carpeted areas.

Radiological Engineering does not anticipate the need for media samples to be collected in any of the survey units. Surface media samples are typically not required for Class 3 survey units. However, surface media sampling will be performed if deemed necessary based on data collected during B111 Cluster pre-demolition radiological characterization.

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Based on this pre-demolition radiological assessment, the following number of measurements are anticipated

14 Survey Units * 15 TSA Measurements / Unit = 210 TSA Measurements

14 Survey Units * 15 Removable Activity Measurements / Unit = 210 Removable Measurements

14 Survey Units * 2 TSA (QC) Measurements / Unit = 28 TSA (QC) Measurements

Total Number of Radiological Measurements

448

This estimate does not include the need to further characterize/investigate areas with elevated activities, and does not anticipate the need for surface media sampling to occur in any of the Impacted Class 3 survey units described in Table 3-1

4.0 CHARACTERIZATION INSTRUCTION FOR NON-RADIOLOGICAL INSPECTION AND SAMPLING

4.1 RCRA Metals and Volatile organics

Process knowledge reveals releases of photographic fixer solution, containing silver and other metals, in the B111 basement. Documentation indicates that the spills were cleaned up, however, cleanup verification data could not be specifically identified, and there is a potential for heavy metal concentrations in the concrete which may exceed the RCRA maximum concentrations for toxicity characteristic. According to historical and process knowledge, no other RCRA-regulated chemicals were used or stored in B111 or B111B (*D&D Facility Characterization Interview Checklist and Facility Checklist*). Three concrete cores (and one duplicate) from the floor in Room #7 will be taken to verify that cleanup was adequate in accordance with PRO-487-MPCR *Metals and PCB Characterization Procedure*. Sediment samples, and one water, immediately peripheral to the Building 111 boundaries will be evaluated for both metals and volatile organics. These samples will be acquired as part of the Sitewide Monitoring Plan, as they are outside the buildings D&D boundaries. However, any results exceeding RFCA action levels would indicate a potential source from Building 111 and would be further evaluated.

The only potential organic contaminant identified in the building was glycol, which was used to protect water systems from freezing. All pipes containing glycol were drained and managed accordingly (water treatment at the Building 995). Radiators within the building that contain glycol will be drained separately during demolition of the building.

Sampling for lead in paint is not required. Environmental Waste Compliance Guidance #27, *Lead-based Paint (LBP) and Lead-based paint Debris Disposal*, states that LBP debris generated outside of currently identified high contamination areas shall be managed as non-hazardous (solid) wastes, and additional analysis for characteristics of hazardous waste derived from LBP is not a requirement for disposal. Therefore, analysis of the lead content of paint in the Cluster is unnecessary and will not be conducted.

4.2 Beryllium

Sampling for beryllium is not required, however ten swipe samples will be taken to confirm the historical evidence that B111 is not impacted by beryllium. There is no record of beryllium operations or storage having been conducted in B111 and B111B (*D&D Facility Characterization Interview Checklist and Facility Checklist*, and the *CBDPP List of Known Beryllium Areas*). Additionally, several administrative work areas, representative of conditions at Building 111, were previously sampled for beryllium, and no beryllium contamination was detected greater than the applicable action level ($0.2 \mu\text{g}/100 \text{ cm}^2$).

4.3 PCBs

Several areas within the B111 Cluster must be evaluated for PCBs. The buildings contain fluorescent light ballasts that may contain PCBs. All fluorescent light fixtures will be inspected to identify PCB ballasts. PCB ballasts will be identified based on factors such as labeling (e.g., PCB-containing and non-PCB-containing), manufacturer, and date of manufacturing. All ballasts that do not indicate non-PCB-containing will be assumed to be PCB-containing. PCB-containing ballasts will need to be disposed of as described in Environmental / Waste Compliance Guidance No. 27, *Management of Fluorescent Light Ballasts*.

The concrete pad under Transformer 111-1 and the secondary containment was covered with pea gravel at one time (since removed) and the pad is believed to have been exposed to undetermined amounts of PCB dielectric oil in the past. Three concrete core samples (and 1 duplicate) will be taken in accordance with PRO-487-MPCR *Metals and PCB Characterization Procedure* from the secondary containment of Transformer 111-1 and analyzed using SW-846 Method 8082. There is no need to sample the Transformer 111-1 dielectric oil. PCB oils were flushed from the transformer in

1986 In 1991, the total PCB concentration in the transformer oil was only 5.5 ppm, and PCBs on swipe samples (13) from the exterior of the transformer were not detectable.

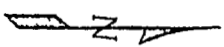
Building personnel and other sources of information suggest that the hydraulic fluid used in the elevator lift system located on the East side of B111 may also contain PCBs, and therefore will require characterization sampling for proper disposition. A total of one sample from the hydraulic reservoir will be taken in accordance with PRO-488-BLCR and analyzed for PCBs using SW-846 Method 8082. Additional samples will be taken as part of the Sitewide Monitoring Plan from sediments/sludges in drain systems adjacent to the Building.

4.4 Asbestos

B111 and B111B will be inspected for friable and non-friable asbestos by a CDPHE-certified asbestos inspector in accordance with PRO-563-ACPR *Asbestos Characterization Procedure Revision 0*. Asbestos will be differentiated as friable and non-friable. Potential asbestos-containing material will be identified for sampling at the discretion of the CDPHE-certified asbestos inspector. Samples of materials will be taken using a Wondermaker™, razor knife, or similar appropriate sampling tool. All bulk samples collected will be analyzed utilizing EPA 600/M4-82020, December 1982 *Interim Method for the Detection of Asbestos in Bulk Insulation Samples* by an NVLAP-accredited laboratory.

5.0 Summary

Existing data on hazards associated with the B111 Cluster are insufficient to address the applicable DQO decision rules. Additional radiological and non-radiological measurements and sampling are necessary. Individual Survey Unit Packages will be developed and included as an appendix to the implementing work control document for the activities included in this Characterization Package.



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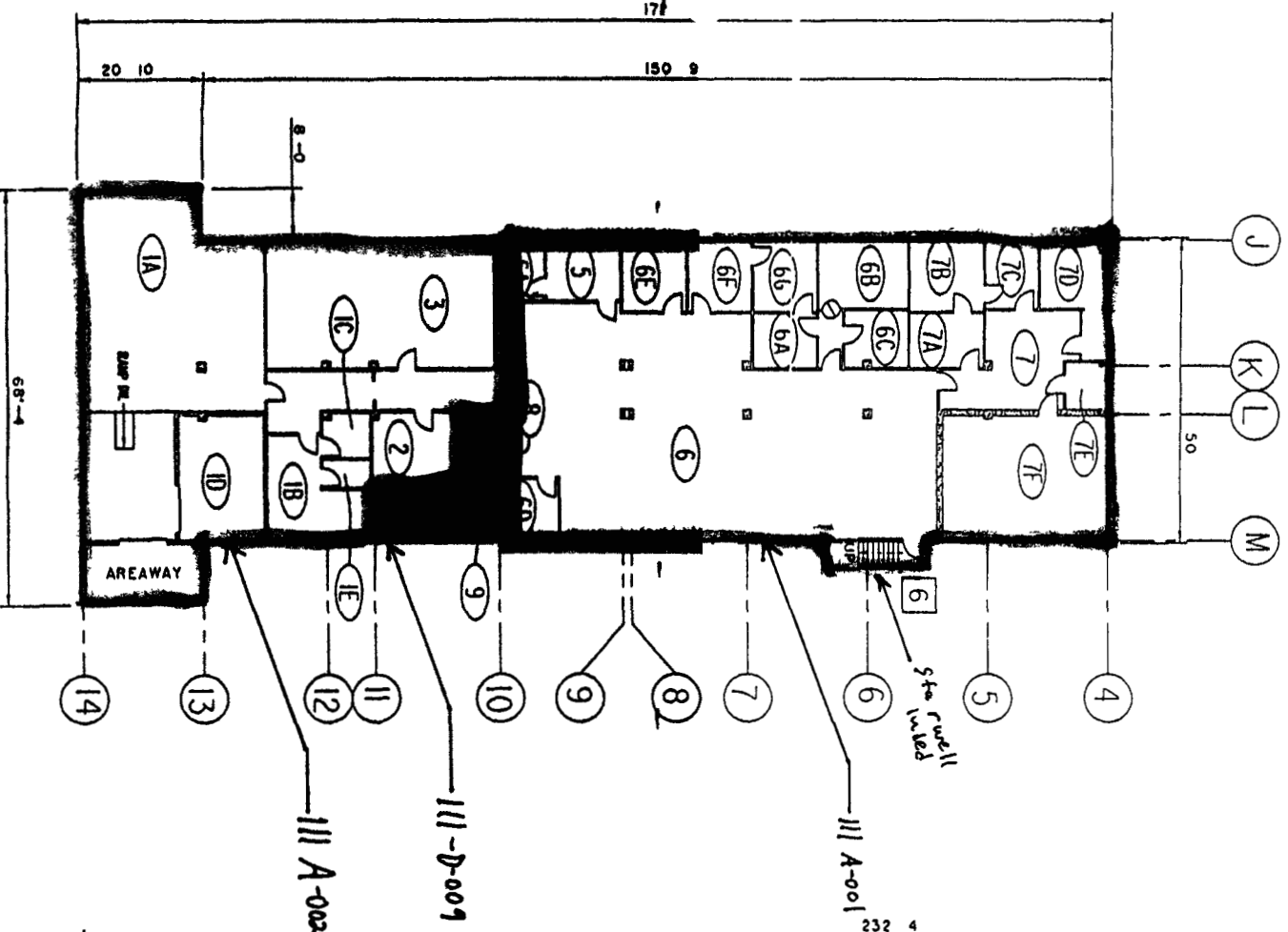
Reconnaissance Level Characterization Package

**Building 111 Cluster
Attachment 1a – Basement & Second
Floor Plans/Radiological Survey Units**

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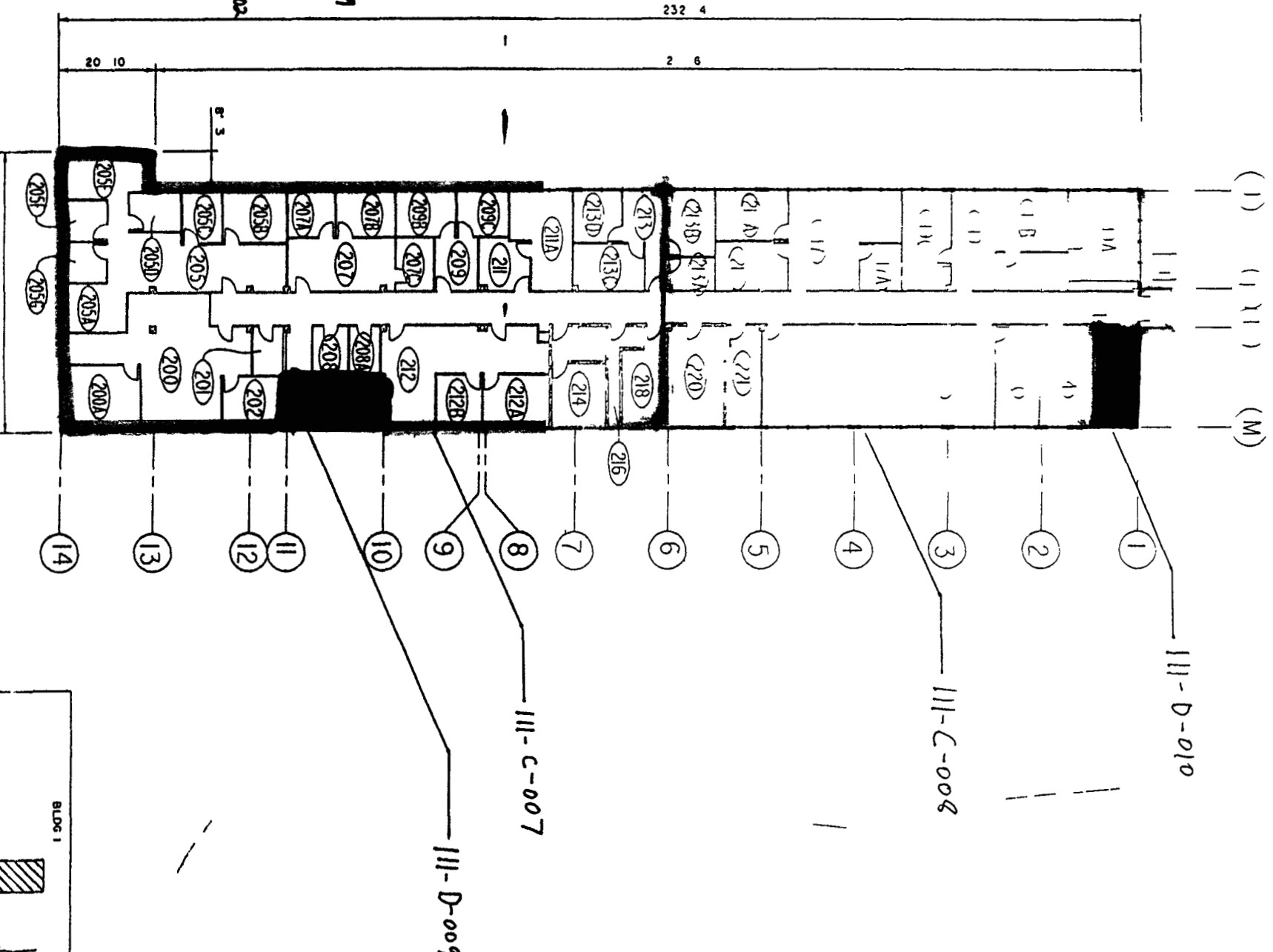
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BASEMENT FLOOR PLAN

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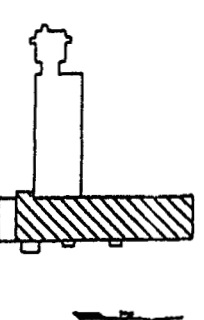


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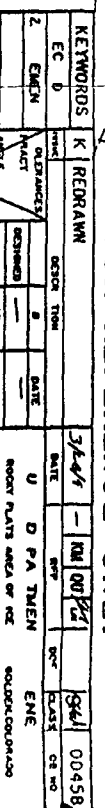


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